

BOOK REVIEWS.

THE SOUTH AFRICAN FUNGI AND LICHENS TO THE END OF 1945. By Ethel M. Doidge, M.A., D.Sc. Pp. 1094, 10 plates, 11 maps. Published as Vol. V for 1950 of "Bothalia." (Pretoria: The Government Printer. 30s.)

Dr. Doidge says that her aim has been "to assemble all available information about the fungi and lichens which are known to occur in Southern Africa or which have been recorded as occurring in the sub-continent, to record the hosts or substrata on which they are found, to indicate as far as possible their distribution and the publications in which reference to South African species has been made." But this fine and important work is far more than a mere compilation, for the information about 4,748 species has been carefully sifted, classified and indexed and she has written a most interesting background to it. This begins with an introduction in which the collections of fungi, lichens and myxomycetes available for study in southern Africa are briefly described. Then comes an account (with a coloured map) of the natural features and vegetation of Africa south of the 15th parallel, selected as the northern boundary for recordings. Against this is sketched in outline the relation of the fungi to the native vegetation. Plants in cultivation and their associated fungi are also discussed.

A "history of observations on the fungi and lichens of South Africa" follows, and this is a specially interesting section. As most of the plant collectors included some fungi and lichens, it becomes a very useful 26-page digest of the history of botanical exploration in southern Africa. Then comes an account, with illustrations, of eight fungi of special interest found by the early collectors. That remarkable Gasteromycete, *Secotium Guenzii*, is the first dealt with. Till this year, it had only been found four times since its discovery in 1840, so it is pleasant to be able to record here that the abnormally heavy rainfall of late April, 1951, at the Cape brought it up in three new localities, in the Tygerberg hills, in the Caledon division and near Riet Vlei in the Cape division.

Fungi on hosts other than vascular plants (on fungi, lichens, insects, fish, domestic animals and man) are next considered and two unworked lines are pointed out—the aquatic Phycomycetes often seen infesting our freshwater algae and the Laboulbeniaceae which are surely present on some of our aquatic insects. This is followed by a miscellany of all sorts of interesting observations on the different groups of fungi as represented

in southern Africa. Regarding the Agaricaceae, Dr. Doidge says: "A study of this group will only be effective when it can be carried out over a period of years by someone familiar with species occurring in other parts of the world." For local areas however it may be possible to employ the method used by Mr. A. A. Pearson and the present writer, for the area within 40 miles of Cape Town. Mr. Pearson came here for the autumn of 1948 and was able to identify 119 agaric species and describe 35 new ones in the two-and-a-half months of his stay. Since his return, he has been able to identify or name as new 26 others from material supplied by the writer; this requires a painting, full description, and drawings of microscopical characters, as well as the dried specimen.

The List of Species occupies 655 pages. It is introduced by an explanation of the abbreviations used, and here Dr. Doidge has supplied a most useful feature, a list of 670 authors' names with dates and the standard abbreviation of each name; the list being arranged alphabetically by these abbreviations. For each species there is a full list of literature references and all its recorded localities for southern Africa. That is to say, all that could be collected from published records and from the collections at Kew and in southern Africa, the list being compiled during 1939-1945 when continental herbaria could not be consulted and the British Museum types had been stored for safety. In the locality records, hosts are given for all parasitic species, and a Host Index arranged by families (with its own alphabetical index) occupies another 227 pages. A Locality Index follows, giving district and province or territory for each locality mentioned, and ten maps cover the area. The volume closes with a full Bibliography, a lengthy Index to the fungi and lichens, and a shorter one to the botanists and collectors mentioned in the introductory sections.

In a compilation like this, a basis for future work, one does not necessarily look for critical accuracy in nomenclature, apart from the material that has passed through the author's own hands (in this case a large proportion of the Ascomycetes, as well as the rusts and other disease-producing fungi). The essentials are lists showing what species have been published, localities, literature lists, cross-references, indices; all most laborious and exacting work. These Dr. Doidge has given us, and in addition we have all the background of general information in the first 75 pages, so clearly presented and so interesting. The whole forms a monumental and most distinguished piece of work, a fitting coping-stone to her career as Senior Plant Pathologist. As Dr. Pole Evans says in his Preface, "She has tirelessly paved the way and truly laid the foundation on which mycology in southern Africa will be built."

EDITH L. STEPHENS.

THE LICHENS IN DR. DOIDGE'S LIST.

In 1894, Ernest Stizenberger, a Swiss medical doctor, geologist and lichenologist completed his list (with supplements) of all the lichens which, up to that date had been recorded for the continent of Africa and adjacent islands, including of course, all those species which had been recorded for South Africa.

Until the publication of the list now under review, no other comprehensive enumeration of South African lichens has appeared, so that the list of lichens in "The South African Fungi and Lichens" by Dr. E. M. Doidge (Bothalia, Vol. V, 1950) is indeed an important event in the history of South African lichenology and constitutes also a welcome addition to the literature of lichenology in general.

Stizenberger's list was arranged according to the system of classification devised by Nylander, but this system has long since been replaced by that of Zahlbruckner, whose recent publication "Catalogus Lichenum Universalis" (1922-1940) has given Dr. Doidge a firm basis for her work.

Primarily, the lichen list consists of those species which have been recorded for South Africa south of latitude 15°S. and includes for each species the author's name, place of publication of the South African record, a reference to Zahlbruckner's Catalogue and the habitat and locality where collected. Occasionally some synonyms are also included and for many of the more recent new species, the type collecting is indicated.

The value of any lichen list will depend, of course, upon the accuracy of the determinations and fortunately in the list under review it is usually possible by reference to the bibliography, to discover who has made them. However, it appears that a number of localities taken from herbarium sheets are here published for the first time and it is unfortunate that these are not indicated as such. Dr. Doidge has given herbarium numbers and the names of the herbaria where the specimens can be seen, so that if necessary it will be possible to re-examine them if suspect. In those cases in which the names of the lichenologists who have identified the plants are given, they may be regarded as reliable. Of the mass of unpublished South African material in Europe, no mention is made, as Dr. Doidge found it impossible to undertake this work.

One of the most interesting aspects of the lichenology of the Southern Hemisphere is the relationships of the lichen floras of the great southern continents to one another and to Antarctica and its surrounding islands and lichen plant-geographers have long felt the need for a new and modern list of the South African species to replace the long out-dated one of Stizenberger.

Owing to the extremely backward state of lichenology in South Africa, the lichen genera of this country which have received critical revision are only those in which South African species have been treated as part of a great world monograph, such as Wainio's "Cladonia," Darbishire's "Roccella" and Magnusson's "Acarospora" or Motyka's "Usnea." The result is that the plant-geographer will have to use Dr. Doidge's list with the very greatest care, as absence from the list does not mean that a plant is not to be found in South Africa, for the South African lichens have as yet been only most superficially collected, but even the presence of a name in the list cannot always be taken at its face value, for over the long period of years which the list covers (1771 to 1945) it is inevitable that some incorrect determinations have been included in the lists of both Stizenburger and Dr. Doidge. Nothing but a complete review of the whole of the recorded species and a critical examination of all the types (now scattered over various herbaria of Europe and even some in America) could produce a faultless list and many years will pass before this can be done. On the other hand, the list forms an excellent basis for the monographer to work from and will save him the many hours of tedious research which would be required to accumulate the scattered records which are here brought together.

As an example of the sort of critical revision which will have to be made before we have a completely reliable list for the use of the plant-geographer, we may take the records of the species of *Siphula* on p. 332. The list records seven species, all of which Dr. Doidge is entirely justified in including, as they have all previously appeared in print as South African plants.

Siphula ceratites Fr. is probably an error of transcription made by someone in Europe, as the duplicate specimen of the number (615) on which this record is based is in the van der Byl herbarium and is *S. tabularis* Nyl., a name which is also written against this number in van der Byl's manuscript number book.

Siphula decumbens Nyl. is a genuine record. *Siphula Dregei*, besides being a nomen nudum is also probably *S. tabularis* Nyl. Dr. Doidge lists the Drège lichens which are enumerated in Meyer's "Zwei pflanzengeographische Documente," Flora, Bd. 2 (1843), from which the record of *S. Dregei* is taken. Unfortunately, Zahlbruckner omitted all of these from his "Catalogus Lichenum Universalis." *Siphula incrustans* Vain. is only an early stage in the development of *S. tabularis*. *Siphula minor* Vain. is a nomen nudum published by van der Byl and is a shade form of *S. tabularis*. Finally *Siphula tabularis* Nyl. and *S. torulosa* Nyl. are well authenticated species and thus only three genuine species remain of the original seven listed.

In a general and unrevised list of species collected over a long period of years, one has to regard with caution some of the early records of lichens which resemble European species. The earlier workers tended to give them the names of previously described plants, but later and more critical and detailed investigations have frequently shown many of them to be distinct species. The other extreme, where every South African specimen has been named a "new species," is to be found in the work of Dr. K. Gyelnik, some of whose work under the genera *Parmelia* and *Sticta* is to be found in the list. To those who know something of the South African lichen flora in the field, it is obvious that most of his new species are merely epharmones. Nevertheless, these names will cause considerable trouble to those who attempt to revise his work. In America, many of Gyelnik's names are already being ignored, e.g. in E. C. Berry, "Monog. Gen. *Parmelia* in North America and Mexico" (1941).

A striking feature of the South African list is the large number of species in genera such as *Lecanora*, *Lecidea* and *Buellia* which are notoriously difficult and have never received a world revision. We may take as an example the genus *Buellia*, for which Dr. Doidge has recorded over 90 species and varieties. Of these, roughly about 58 per cent have been recorded only from South Africa and are based on a single collecting and about 5 per cent are similarly recorded for South Africa only, but are known from several localities. 37 per cent are known from other countries besides South Africa. Thus 63 per cent of the total recorded species of *Buellia* have been found in South Africa only, which would indicate for this genus a very high degree of endemism in a lichen flora which, on the whole seems to have relatively few endemic species and even fewer endemic genera. One is tempted to infer that in many cases it has been easier to describe a species as new than to discover with certainty whether it is or is not one already described. Only a world revision can elucidate the real value of these species and thus make possible a comparison of the South African flora with the floras of the remaining southern continents. It is of interest to compare the South African figures with those of another sub-continent having a great variety of climate, but where the flora is better known. We may take Bruce Fink's "The Lichen Flora of the United States" (1935), where the figures are: *Buellia*, 29; *Lecidea*, 71; *Lecanora*, 68. The corresponding figures for South Africa are 92, 111 and 82 respectively.

Several nomina nuda in the list will puzzle lichenologists who are not familiar with the history of lichenology in South Africa. The late Prof. van der Byl sent collections of lichens for identification to various lichenologists in both Europe and America. He also published a list of names and proposed names given to him by these lichenologists for

the plants in his herbarium, a list unfortunately marred by numerous errors of various kinds, including several new name combinations which were evidently inadvertently made, as he attributed them to others. This herbarium list appeared in print (*Ann. Univ. Stellenbosch*, IX, 1931) before the descriptions of several lichens were published and as in some cases the descriptions were never published, owing to the deaths of Wainio and Merrill, the names remain nomina nuda. The specimens sent to Merrill are presumably in the Farlow Herbarium.

Little has escaped Dr. Doidge's search of lichen literature, but there are a few omissions of some importance. Massalongo's "*Lichenes Capenses*" (1861), contains a few new species attributed to the Cape, but Stizenberger discovered (*Flora*, Bd. 73 (1890) 184), by consulting Wawra's original journal and number book in Vienna, that they came in fact from Ascension. Thus *Opegrapha Zanei* Mass. and *Chiodecton capense* (Mass.) Zahlb. came originally from this island and the types are not from the Cape. *Rocella Hereroensis* Wain. was, on the evidence of the gonidia, shown to be an *Usnea* by Darbishire (*Ann. Crypt. Exot.* V (1932) 160) and was also treated as such by Motyka (*Monog. Gen. Usnea* (1938) 640).

Sufficient has now been said to indicate the very varied worth of the lichens recorded in the list, but it would be well to emphasize that most of the records it contains are lichens from the sea coast, or from inland areas of relatively low altitudes; the high mountain flora of South Africa is as yet almost unknown. It is in the higher altitudinal zones of 5,000 to 10,000 ft. that we may expect new discoveries to be made which are of importance to plant-geography and some very recent high altitude expeditions have already demonstrated this. Dr. E. Frey in a paper entitled "*Neue Beiträge zu eine Monographie der Genus Umbilicaria*" (*Ber. d. Schweiz. Bot. Gesell.*, 59 (1949)) has recently added several new records and new species of *Umbilicaria* to the South African list, from material collected at high altitudes by Mr. E. Schelpe and Miss E. Esterhuysen. The ecological aspect is treated by Mr. Schelpe in "*Observations on the Ecology of the South African Umbilicariae*" (*Jour. S. Af. Bot.* Vol. XVI (1950) 39-45) where the habitats are described from personal observation.

Regarding the future of lichenology in South Africa, it may be said at once that until adequate collections can be built up in the South African herbaria, so as to provide the material for the monographer to work with, little or no advance can be made. One of the greatest bars to progress is that so much material has gone to Europe and so few well authenticated specimens have remained in South Africa. Even for the extensive collections made by MacOwan which form the basis of the South African material in Stizenberger's list, no duplicates remain in

South Africa, where they would obviously be of the greatest value. The original MacOwan collection is almost entirely at Zurich, but a few specimens determined by Stirton are in the Glasgow Museum.

Thus the lack of type material and of the necessary literature will for many years to come render the study of lichenology in South Africa a most difficult one, but all botanists owe a debt of gratitude to Dr. Doidge for her careful and thorough work in compiling this list and thus making a start with what is obviously the first step towards a fuller and more accurate knowledge of the lichen flora of South Africa.

S. GARSIDE.

ADAPTATION AND ORIGIN IN THE PLANT WORLD. THE ROLE OF ENVIRONMENT IN EVOLUTION. By Frederic E. Clements, Emmett V. Martin and Frances L. Long. Waltham, Mass. Chronica Botanica Co. (Johannesburg, Central News Agency). xiv+332 pp., 54 plates, some in colour. 1950. \$6.00.

This is an account of work which was begun in 1900 and which was continued through many vicissitudes until 1945, when both Dr. Clements and Dr. Long died. The publication has been carried through by Mrs. Clements, who is herself responsible for many of the excellent illustrations.

Experimental stations were established at various altitudes (up to 12,000 ft.) on Pike's Peak and on the California coast and, by means of transplantation and artificial control of conditions, the effects of environment on plant form were studied. The work was, in fact, a continuation of the pioneer experiments of Gaston Bonnier on Alpine plants. The results of this study are disappointing from the point of view of the fundamental processes of evolution. They show, more intensively and extensively than in previous work of this kind, the modifications in form which are a direct response to environment; and they emphasize the fact that many supposed species, as judged by herbarium methods, are merely ecads resulting from the physiological adjustment of plastic organisms to their conditions of soil and climate. But they do not show how a "good" species, with all its range of ecads, can be changed into another "good" species. The plant world is not a continuum: no species is infinitely plastic and herbarium study, though often based on inadequate evidence, is not entirely futile or mistaken. "Natural selection" say the authors "does not operate upon the forms produced by adaptation, since they are immediately in harmony with the environment that produces them." This is true enough; but it throws no light on the origin of species. Though the authors use the words *origin* and *evolution* in their title, they do not go so far as to assert that forms produced by response to conditions are eventually fixed genetically; and though they speak of

"fixation" they bring no proof, nor do they say in so many words, that this "fixation" is genetic.

The book is valuable from the point of view of morphogeny, though it does not elucidate the mechanism of evolution. It is welcome as witness to the experimental side of Clements' vast ecological studies, which have had so wide an influence on botanical thought.

R. H. COMPTON.

AN INTRODUCTION TO THE STUDY OF VIRUSES. By Kenneth M. Smith, F.R.S. Pitman's Microbiology Series. Pp. 106, 16 plates, 13s.

The first number in the Microbiological Series set a very high standard for its successors. If subsequent volumes should be of such a standard, they will be a great boon to all scientists who are endeavouring to keep abreast of advances in fields other than their own.

This small volume sets out to introduce the reader to the virus and it does so admirably and concisely. Starting with the first recorded case of smallpox in China, nearly 4,000 years ago, the book describes all the important advances right up to the use of the electron microscope and the modern antibiotics in the study of viruses.

The presentation of the material is excellent. The virus is the main theme and everything revolves around it. It is not segmented into plant and animal viruses and bacteriophages. It scorns these artificial divisions and treats viruses as a whole. While this of course means that the author assumes a certain scientific background on the part of the reader, this is entirely justified, as most people who read the book will have some scientific knowledge. The treatment of insect vectors is an instance of this. Even non-zoologists can follow the discussion with absolute ease.

Many interesting facts are brought home very clearly. For instance the fact that some viruses can be seen under a good microscope, as is the case with the virus causing polyhedral disease in certain insects, and the fact that tobacco virus sometimes occurs in concentrations of 0.2 per cent in the sap, are neatly brought to the reader's notice. For those who prefer something more thought-provoking than a mere series of facts, the role of the viruses in plant and animal cancers is discussed with clarity.

The chapter on electron microscopy, with its illustrations, is very informative. In the space of a few pages, the author gives a remarkably clear account of the electron microscope, its method of utilization and its uses. Most biologists will appreciate this as there is no doubt that the electron microscope will play an increasingly important role in biological research.

The book is most readable and the style of writing fluent, with the exception of the chapter on the Serology of Viruses. The author is indeed to be congratulated on the way in which he has co-ordinated so much information in so skilful a fashion.

K. H. SCHÜTTE.

PLANT VIRUSES AND VIRUS DISEASES. By F. C. Bawden, F.R.S. Third Edition. Waltham, Mass.: Chronica Botanica Co. (London, W.C.2; Wm. Dawson & Sons, Ltd.). Pp. 335, figs. 59. \$6.00.

The fact that this is the third edition of this book is in itself a recommendation for its contents. It is the ideal volume for a comprehensive introduction to plant viruses. That does not mean that it reads like a dull text book. The ease and clarity of the style in which it is written make it a pleasure to read. Mr. Bawden did not make a rush-job of this publication, which shows every sign of neat and careful preparation, from well turned phrases to comprehensive references to the literature at the end of each chapter.

As our knowledge of viruses has increased rapidly during the last decade, this book must be more than a mere reprint of the 1939 edition and such is the case. All the subject matter has been brought up to date so far as is possible and an extra chapter has been added. These additions have been skilfully inserted into the old framework of the previous editions.

As well as clearly showing what is known about viruses, Mr. Bawden also points out what is not known; for instance, he devotes an entire chapter to the taxonomy of viruses, showing where and how any of the present systems of classification are incomplete or of little value. When it is borne in mind how big are the gaps in our knowledge of the viruses, a certain amount of speculation must be expected. While there is a very noticeable amount of this, the author always manages to keep his facts and his speculations apart; there is no danger of mistaking one for the other.

The fact is repeatedly brought home that physiology, especially the physiology of infected plants, has not been studied sufficiently to enable any real generalized information to be obtained. This unfortunately is retarding advances in the field of virus research.

There are very few noticeable flaws in the book. Perhaps it is possible to question Mr. Bawden's contention that the control of viruses diseases, by normal cultural practices, has not yet been widely tried out. It is certainly true for temperate zones, but in East Africa, on the O.F.C. plantations, great efforts have been made to combat Rosette disease in the groundnut by controlling the planting dates within very narrow limits.

The production of the book is good with the exception, in the copy sent for review, of the cutting and binding of the pages between pages 70-80. This was poor and has caused the printed matter to appear in rather unusual positions.

K. H. SCHÜTTE.